May 2005 Mark Scheme

Paper 2H

1.

Material	Use	Property
aluminium	Overhead electricity cables / coins / window frames	Good conductor of electricity / resists corrosion
copper	Overhead electricity cables / coins	Good conductor of electricity / resists corrosion
poly(chloroethene)	Insulation on electrical wires / window frames	Does not conduct electricity / resists corrosion
poly(ethene)	Injection moulding	Low melting point

Total 5 marks

2. (a) (i) calcium 1

(ii) limewater 1
milky / cloudy / white ppt 1

(iii) carbonate 1

(b) (i) Fe^{2+} 1

(ii) iron(II) hydroxide 1

(iii) sulphate 1

(iv) $BaSO_4$ 1

(c) any two from chloride / bromide / iodide 2

(d) (i) $CaCO_3$ 1

(ii) $FeSO_4$ 1

Total 12 marks

3. (a) (i) air 1
natural gas / oil **NOT** methane 1

(ii) 450°C (±50°C) 1
200 atm (±50 atm) 1
iron (catalyst) 1

(iii) liquefied / cooled / condensed 1

(iv) recycled / fed back into reactor 1

(b) $NH_3 + HNO_3 \rightarrow NH_4NO_3$ **or** $NH_4OH + HNO_3 \rightarrow NH_4NO_3 + H_2O$ 2
formula of reactants (1 mark); formula of products (1 mark)
incorrect balance **maximum 1**

Total 9 marks

4. (a) BITUMEN: (waterproofing) roofs / roads / tarmac 1
KEROSENE: (fuel for) aircraft/ stoves / lamps 1

(b) (i) gasoline + oxygen → carbon dioxide + water 1
ALLOW petrol / octane as reactant

(ii) insufficient/limited oxygen / air 1

(iii) carbon monoxide 1
toxic / poisonous 1
reduces ability of blood to carry oxygen / mention of (carb)oxyhaemoglobin 1

OR

carbon / soot (1 mark)
specified effect on lungs / respiratory system (1 mark)

(c) heat / boil 1
suitable apparatus (container to heat in; condenser; thermometer) - can be shown in diagram 1
collect sample boiling between 80°C and 120°C (depends on apparatus) 1

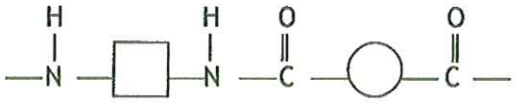
Total 10 marks

5. (a) condensation 1

(b) (i) (di)amine **ALLOW** amino 1

(ii) (di)carboxylic acid 1

(iii) alternating circle and square 3
correct linkage between blocks (NH-CO- is minimum)
two NH and CO groups in correct positions is minimum



must have 'continuation bonds' for 3rd mark
ALLOW terminal COOH or NH_2 if brackets used round repeat unit

(c) low 1
weak 1
molecules 1

Total 9 marks

6. (a) **atoms** of the same element / with the same number of protons / same proton number / same atomic number — 1
but different numbers of neutrons / different mass numbers — 1

(b) (i) number of protons **and** atomic number = 37 — 1
number of neutrons = 48 — 1
mass number = 87 — 1

(ii) (85 x 0.72) + (87 x 0.28) — 1
= 85.6 — 1

(c) same number of electrons (in outer shell) / both have one electron in the outer shell / same electronic configuration
(mention of protons or neutrons = 0) — 1

(d) (i) Rb_2O — 1
RbCl — 1

(ii) rubidium fizzes / bubbles / moves around (**NOT** gas given off)
rubidium disappears / dissolves (**NOT** floats)
rubidium melts / forms a ball or sphere
flames / catches fire / explodes
} any two — 2

(iii) $2Rb + 2H_2O \rightarrow 2RbOH + H_2$
correct formulae of products — 1
balancing correct equation — 1

Total 14 marks

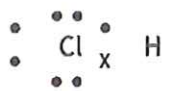
7. (a) potassium manganate(VII) / potassium permanganate — 1
oxidising agent / to remove hydrogen — 1

(b) (i) $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ — 1

(ii) brown / red / orange **NOT** yellow — 1

(iii) chlorine more reactive than iodine / iodine less reactive than chlorine / chlorine a better oxidising agent than iodine / iodide better reducing agent than chloride (must have both species) — 1

(c) (yellow-) green — 1
to colourless / misty/steamy fumes — 1

(d) 

shared pair of electrons between H and Cl — 1
total of 8 electrons in outer shell of Cl and 2 in H — 1

(e) (i) (A) red / pink 1
(hydrochloric) acid formed / solution contains H^+ ions 1
NOT HCl is acidic

(ii) (B) blue / no change 1
no acid formed / liquid neutral / no H^+ ions / 1
HCl doesn't dissociate

Total 13 marks

8. (a) electrons free to move / flow / mobile 1

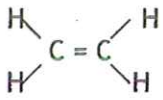
(b) ions 1
cannot move / in fixed positions (unless molten) 1
Any mention of free electrons / covalent bonds / ions forming = 0

(c) B / – for first reaction and A / + for second reaction 1
reduction for first reaction and oxidation for second reaction 1

(d) (i) (amount of Pb =) 0.05 (moles) 1
(amount of Br_2 =) 0.05 (moles) 1

(ii) M_r of bromine = 160 1
mass = 8 g 1

Total 9 marks

9. (a)  1

(b) water / steam 1
heat (300°C ± 50°C) 1
phosphoric acid (catalyst) 1
IGNORE references to pressure

(c) (i) sugar / carbohydrate **ALLOW** sucrose 1

(ii) fermentation 1

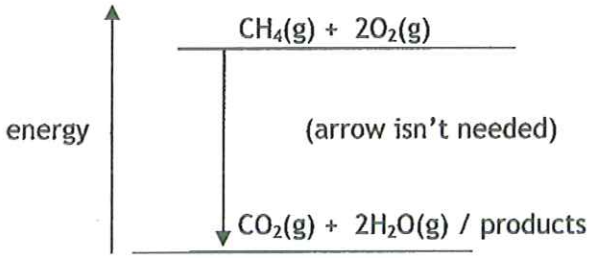
(d) oxidation **NOT** redox 1
potassium dichromate(VI) **ACCEPT** manganate } or correct formulae 1
sulphuric / phosphoric / hydrochloric acid } 1

(e) (i) ester 1

(ii) compounds with the same general formula / formula (of neighbouring members) differ by $-CH_2-$ 1
similar (**ALLOW** same) chemical properties 1

Total 12 marks

10. (a) products shown at lower energy 1



(b) bonds broken = (4 x 412) + (2 x 496) / 2640 1
bonds formed = (2 x 743) + (4 x 463) / (-)3338 1
energy change = -698 (kJ/mol) 1

(c) increase temperature 1
increase pressure / concentration 1
add (named metal) catalyst 1

(d) (i) (⇌) reversible reaction 1
(ΔH) enthalpy / heat (energy) change **NOT** 'energy change' 1

(ii) (pressure increased) amounts reduced 1
(temperature decreased) amounts reduced 1
ALLOW 'decreases yield' but **NOT** 'equilibrium shifts to left'

Total 11 marks

11. (a) (i) 56 1

(ii) 0.25 1

(iii) $0.25 \div \frac{250}{1000}$ 1

1.0 / 1 1

(b) (i) 0.4 1

(ii) 0.2 1

(iii) 4.8 dm^3 1

Total 7 marks

12. (a) allotropes 1

(b) covalent **NOT** 'giant covalent' without mention of bonding 1
shared **pair** of electrons 1
attraction between nuclei and (bonding) electrons 1

(c) cutting / drilling / grinding 1

(d) (diagram showing)
(three) fused hexagonal rings 1
all carbon atoms shown 1

(e) many / strong (covalent) bonds (between atoms) 1
much heat / energy needed to break them **NOT** hard to break 1
any mention of 'ionic' = 0

Total 9 marks